Our Public Lands

FALL, 1977

PUBLIC LANDS

A NEW DIMENSION FOR WILDERNESS

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Our Public Lands

Contents

The Red Rocks Canyon Recreation Area is among the scenic areas to be found on the public lands. Many areas of the public lands have wilderness values, and Congress has now authorized the Department of the Interior to study these lands for possible inclusion in the National Wilderness System.

U.S. DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

U.S. Department of the Interior. As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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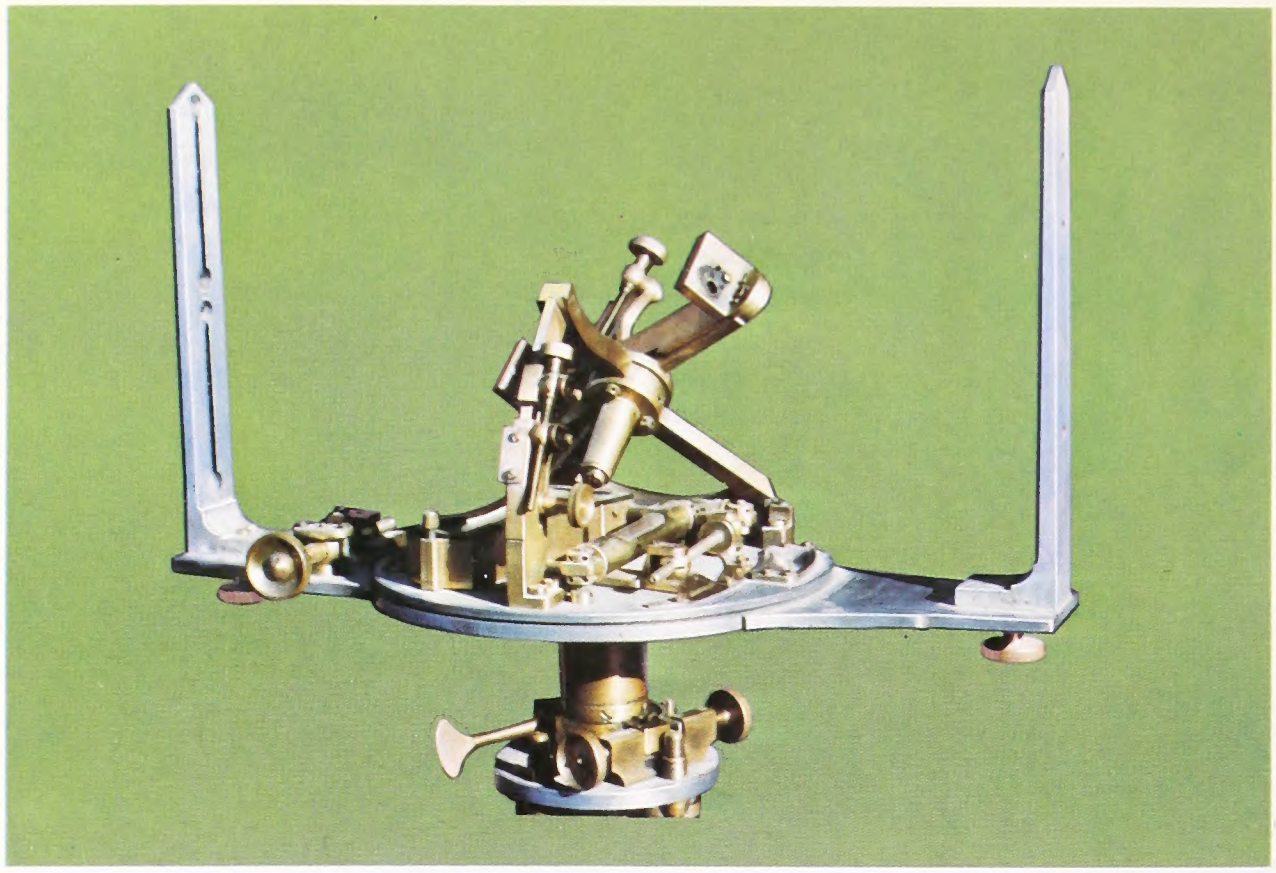
NOTICE TO PUBLISHERS

Starting in 1785 the General Land Office Assumed Responsibility for the Survey of the Public Domain.

To Measure The Earth

It has been said that "Good fences make good neighbors." Agreement over boundaries, whether between Nations or individuals, also make good neighbors; conversely, wars and expensive litigation have resulted when boundaries were poorly defined or were in dispute.

A clay tablet, dating back 5,000 years, shows a map of a surveyed portion of the Kingdom of Assyria.



Burt's solar compass used the sun to determine true north as opposed to the magnetic needle.

References to the measure of land and to boundary markers are also found in the Old Testament, along with proscription of penalties for those who remove such markers.

By the time the Colonies had gained their independence, there were deep concerns about the orderly development of the western lands, and the need to record titles and mark boundaries was clearly understood.

As soon as the Continental Congress could turn its attention from the winning of the war, the matter of western lands received prompt attention. While all were agreed that the recording of land titles and the marking of boundaries of private lands was most important, they soon fell into controversy over methods and systems.

The Southerners believed that a man should be free to go anywhere he wanted to find suitable land, and that once he found it, he should be allowed to lay out his holdings in any configuration he wanted to. This system, known as "metes and bounds," had been followed in most of the colonies and by the settlers in Tennessee and Kentucky.

However, the New Englanders favored a rectangular system of survey with boundary lines running north-south and east-west. The debate was bitter, but the New Englanders prevailed, and the Ordinance of 1785 made the survey of public domain a prerequisite to settlement, and called for the rectangular system of cadastral survey.

Cadastral survey has been defined as the art of creating, recreating, marking and defining of boundaries of tracts of land. When the Bureau of Land Management inherited the functions of the General Land Office, it became the Nation's final authority on all matters pertaining to the survey of the public lands. Once a survey has been made and accepted by the Bureau, the boundaries established become final.

Our present system of public land survey still retains the basic elements set forth in the Ordinance of 1785, but subsequent legislation and regulations have added refinements.

Under the cadastral system the public domain is plotted into a grid of squares, each approximately six miles to the side, called "townships." Before any measurement can be made, the surveyor must define an initial point for which he knows the exact latitude and longitude. From that initial point he runs two lines, one north-south, the other east-west. The north-south line becomes a principal meridian and is identified by a name—the Salt Lake Meridian, for example. The east-west line becomes the base line for that meridian.

Working along the principal meridian and the base line, the surveyor sets township corners at six-mile intervals, and then, by extension, the tract is marked off into a grid. Each of the six-mile squares is a township of 36 square miles, or approximately 23,040 acres. Any specific township can then be located according to its relationship to the principal meridian and the base line that intersects it.

The township is further divided into sections of one-mile squares containing 640 acres. Individual sections are identified by a numbering system that starts with section 1 in the northeast corner of the township and ends with section 36 in the southeast corner.

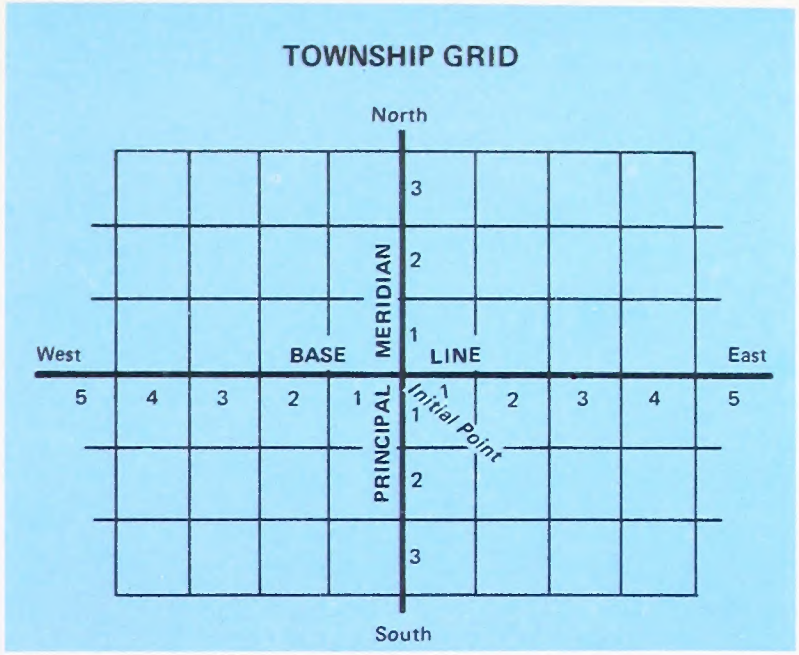
The section can be further subdivided into quarter sections of 160 acres which became the basic unit under the Homestead Act of 1862. Quarter sections can be divided into 1/8 sections of 80 acres or into 1/16 sections of 40 acres. etc. (see figure 3)

There are advantages and disadvantages in the rectangular system of survey. From the surveyor's point of view, it simplifies mapping and record keeping since lines are straight and corners are square. It also provides a simple but definitive means of identifying a given tract of land.

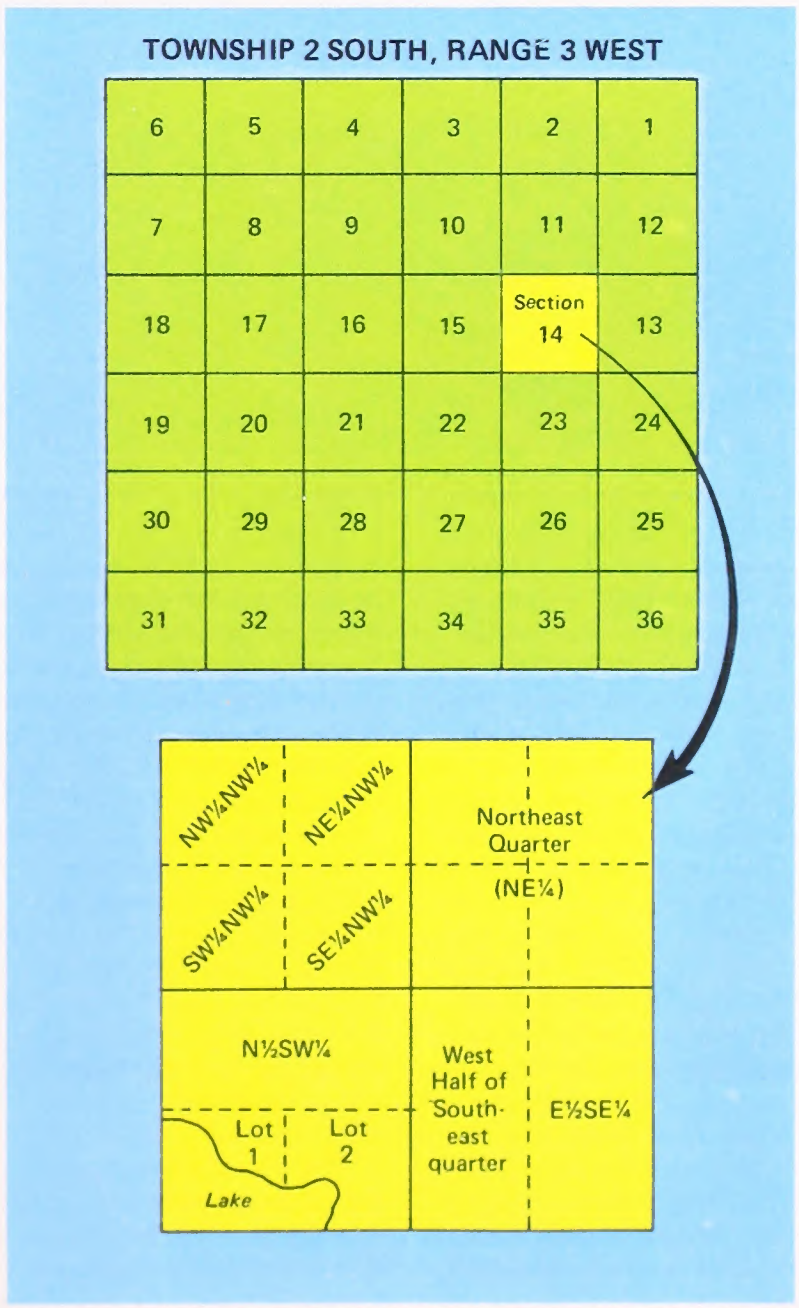
From the settler's point of view, the rectangular system forced him to take undesirable land along with that he deemed desirable. However, this disadvantage may have been more than offset since there was less chance of boundary disputes and fewer cases of expensive litigation than there would have been under a system of metes and bounds.

What may seem simple in theory often becomes difficult to execute. Marking boundaries with straight lines running north-south and east-west is a disarmingly simple concept, but running such a boundary in the field is another matter. First, it is exceedingly difficult to mark a perfectly straight line for several hundred miles across rough terrain and through all kinds of vegetation.

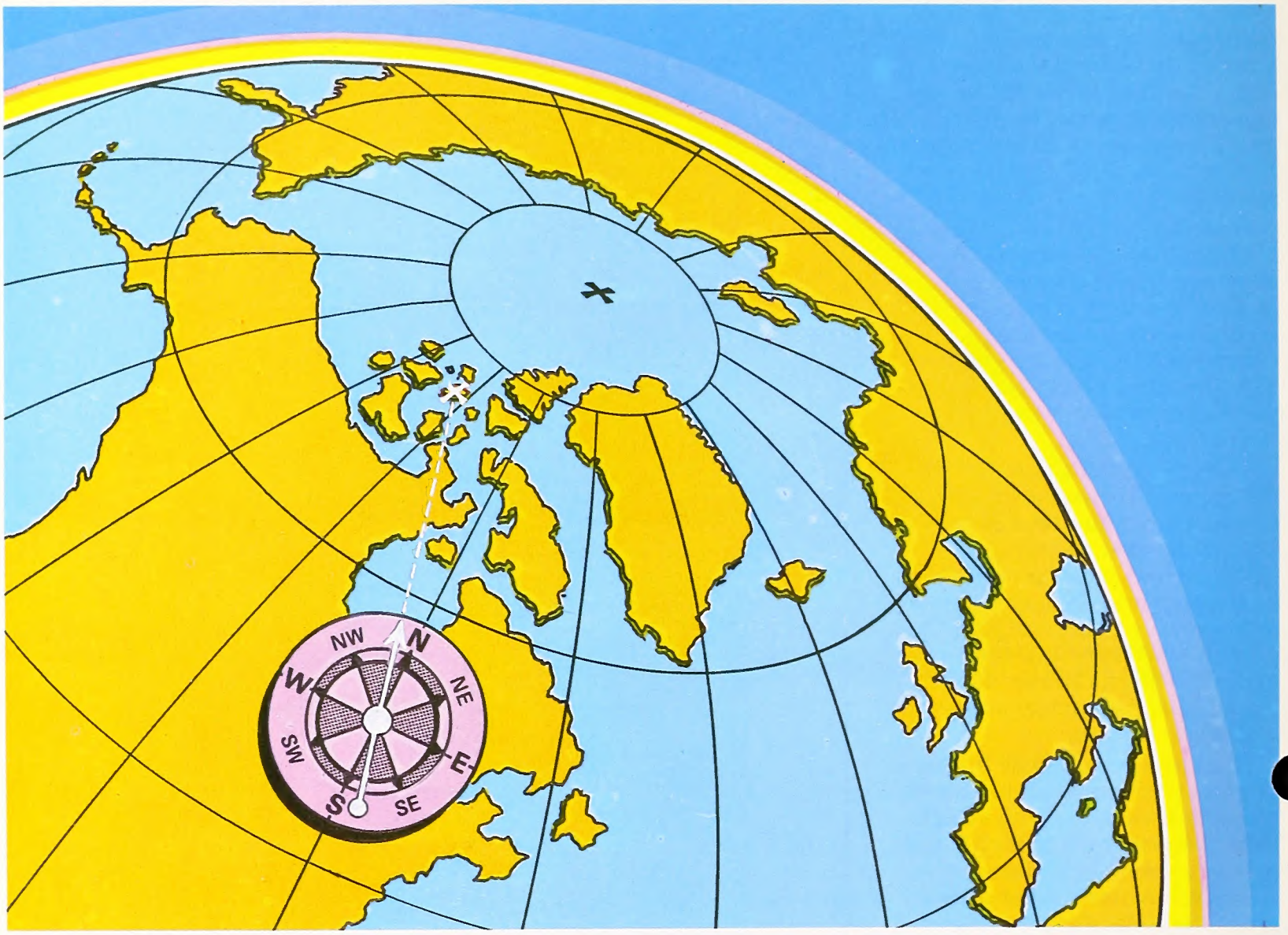
Another problem is the curvature of the earth which causes straight lines running north and south to draw together as they approach the poles. For this reason a tract of land laid out along such lines is not quite a perfect square, and its angles are not quite perfect right angles. In such a measurement the line marking the north boundary of the section is slightly shorter than the line marking the south boundary (presuming of course, that you are in the northern hemisphere.) Now in a single section of land the difference between the length of the north and south boundary is so slight that it makes no real difference. But if the north-south lines are extended far enough, a sizable distortion is bound to appear. For this reason, surveyors measuring along the principal meridian establish what is



Working from a principal meridian and a base line the surveyor marks off the township lines into grids of 36 square miles.



Townships were further divided into sections of one square mile (640 acres). Sections are then numbered from 1 to 36.



Magnetic declination caused by the fact that the magnetic pole is located almost 1000 miles from the true North Pole.

called a "correction line" after every fourth township, or every 24 miles. The base of the township above the correction line is allowed to extend over the boundary of the township below. This offset allows for the convergence of the north-south lines and keeps the acreage of the townships approximately the same.

The amount of each offset increases as the lines move north. For example: an offset down near the equator might amount to no more than a few feet, while the offset in northern Alaska can be as much as a tenth of a mile.

When the surveyor had to depend on the magnetic compass to run his line, he had to constantly bear in mind that the needle rarely pointed true north. The difference between true north and the direction of the needle was known as the "magnetic declination," and was caused by the fact that the magnetic pole, to which the needle pointed, was not located at the North Pole.

At the present, the magnetic pole is found on Canada's Prince of Wales Island at about 76 degrees, 12 minutes north and 101 degrees west, or almost 1,000 miles from the true North Pole. We must say "about" for to complicate matters still more, the magnetic pole is not stationary, but shifts slightly from year to year. Since only along two longitudes does the magnetic compass point true north, the early surveyors had to make corrections in all their readings when running a line.

The declination caused by the magnetic pole could be predicted. What was more troublesome, were those declinations caused by other anomalies such as deposits of iron ore. In some areas it was the erratic behavior of the magnetic compass that led to the discovery of large iron deposits.

Eventually the shortcomings of the magnetic compass led to a search for a better means of determining true north. The search was rewarded in 1836 when William A. Burt, a deputy surveyor under contract to the General Land Office, patented the solar compass.

Burt designed his solar compass to take advantage of a principle astronomers and navigators have known and used for generations—that there is a fixed relationship between the sun and the earth. Navigators have used the position of the sun in the sky to determine the location of ships at sea and of men traveling in unknown country. Burt recognized that with a properly designed instrument could also use the position of the sun to determine true north from any fixed position on the earth.

The relationship between earth and sun changes continuously because the earth orbits around the

sun while spinning on an axis that is tilted at an angle from the perpendicular of the plane of the earth's orbit. A further complication is caused by the bending of the sun's rays as they pass through the atmosphere of the earth. This bending, called "refraction" creates an optical effect that distorts the true position of the sun and is more pronounced in early morning and late afternoon and less pronounced at solar noon.

Because of the earth's movements, the sun appears to arch across the dome of the sky from east to west during the course of the day and to move north or south according to the seasons. The precise location of the sun changes from hour to hour and from day to day. These daily and hourly variations have been compiled in tabular form and printed in a publication known as the "ephemeris." With data from the ephemeris and accurate measurements of the position of the sun, the surveyor can determine his exact location on any given day and hour.

In use, the solar compass is mounted on a tripod and leveled over the precise spot from where the survey line is to be run. The proper angular values of the latitude and the sun's declination are set on the respective arcs of the solar compass. Once these settings have been made and the solar compass is locked in on the position of the sun, the axis of the compass is aligned to true north. Graduated arcs on the compass now allow the surveyor to determine the direction of any point on the horizon.

As a further refinement, a magnetic needle on the solar compass lets the surveyor determine the degree of variation between true north and magnetic north for that particular location. Burt's solar compass became widely used in surveys of western lands and eventually replaced the magnetic compass altogether. However, it is a typically American instrument, a product of "Yankee ingenuity" and not widely known abroad.

Early surveyors used a "chain" to measure their lines. The adoption of the chain was one more milestone in man's continuing efforts to make his measurements accurate. The advantage of a metal chain over rope or cord is obvious when you remember that the length of a line made with rope or cord will vary when tension is exerted or when the line is wet or dry. The surveyor's chain is made up of 100 links and is 66 feet long. An area of ten square chains is one acre in area, and a line of 80 chains equals a mile. Today the chain has been replaced by the even still more accurate steel tape. The tape is also much easier to carry. They range in length from 1 to 8 chains and are graduated to links and tenths of links.

A still more sophisticated measuring device is designed to measure the time it takes electronic impulses, sound waves or laser beams to travel between the points to be measured. Such instruments are accurate, but tend to be cumbersome and in many situations, the gain to accuracy is not worth the trouble and expense involved in transportation and getting them set up. Yet they have real value in rough mountainous country where it becomes difficult to run a line between given points.

The largest area of unsurveyed land today is in Alaska. In 1971, Congress passed the Alaska Native Claims Settlement Act providing for a grant of 40 million acres of Federal land to be State's Eskimos, Indians and Aleuts. In the same Act, Congress called for an additional 80 million acres of public lands to be set aside for inclusion in national parks, wildlife refuges, national forests and as wild and scenic rivers. The Alaska Statehood Act had already provided for the State to select 104 million acres from the public domain

Before any of this land could be transferred and titled to Natives or to State and Federal Agencies it was necessary to survey boundaries so that legal descriptions could be incorporated into the patents of transfer.

It was immediately apparent that the old methods of survey were much too slow for a project of this magnitude and urgency. Accurate surveys with ground crews, transit and chain would take years. A fast and accurate method for locating township corners was needed. It was apparent that the solution would have to come out of computer technology.

Out of the search came something called an "auto-surveyor"—an inertial guidance system similar to the ones used in airplane navigation.

The system combines the principle of the gyroscope into a specially designed computer. Once the computer is adjusted to a starting location, the gyroscope reacts to all subsequent horizontal and vertical movement and the computer measures the strength and duration of the impulses and translates them into direction and distance with uncanny accuracy. This information is, in turn, translated into numbers that appear on a panel and tells the operator his exact location in terms of latitude and longitude at all times.

In Alaska, where roads are few, the computer is placed aboard a helicopter and flown overland until the computer reading indicates that the helicopter is hovering over the point where the surveyors want to locate a corner. A flag is then dropped to mark the approximate location. This is followed by a ground crew which more precisely locates and sets the survey marker at the corner position.

The inertial guidance system provides both speed and accuracy in the surveying of land. However, at the present stage of development, the system is not too well suited for work in large areas of the lower 48 states because most of the survey effort is devoted to recovering physical evidence of original corner monuments and of bearing trees.

Property lines are no less important today than they were in the days of our fathers. Important considerations and even fortunes may ride on the precise location of a line based on a survey corner. When the original marker that defines the boundary of Federal land disappears, it becomes the responsibility of the Bureau to reestablish it.

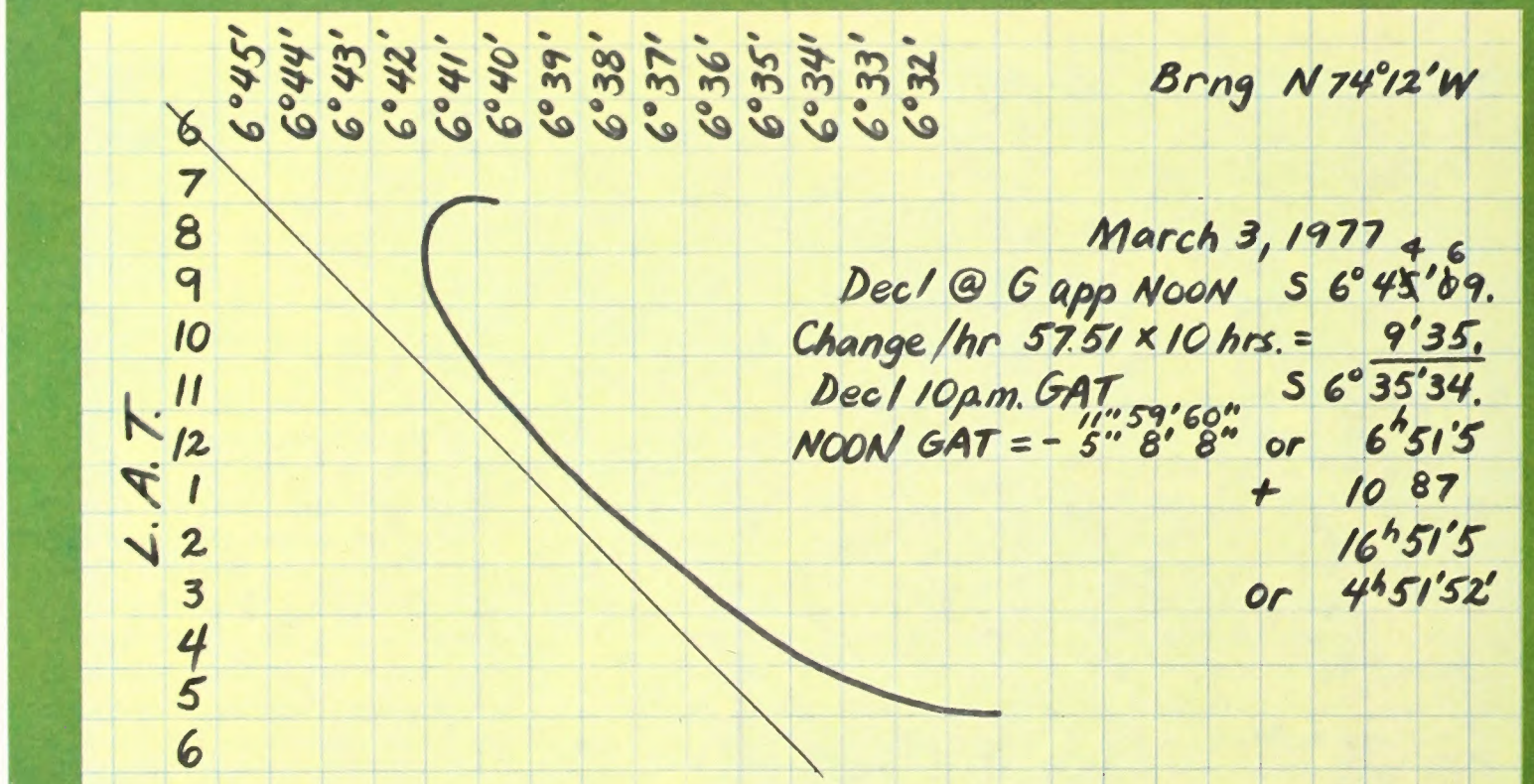


Chart used to compute the refraction of the sun's rays as they pass through the earth's atmosphere.

In many cases, the finding may be a simple matter of talking to local residents and land owners. Courts have accepted the testimony of reliable witnesses who have reason to know where such corners were located. However, when all else fails, the surveyor's last resort is to retrace the old survey in an effort to find the original location of the corner marker. In these efforts the surveyor is often called on to combine the skills of an expert surveyor with the persistence, patience and intuition of a master detective.

The early surveyors marked their corners with wooden posts inscribed with appropriate markings to identify that particular corner. Later, surveyors used iron posts. Decay, rust, construction and vandalism have caused many of these markers to become lost or obliterated.

In retracing the earlier survey, the modern surveyor must first assemble the original field notes and learn as much as possible about his older counterpart before he goes into the field. He can only hope that he is retracing the work of an honest and competent man and that the instruments he used were accurate.

Much of the early survey work was contracted to private surveyors, and while the vast majority of those contract surveyors were honest and competent, a few were not. Instances of field notes being composed in the comfort of a local bar are not entirely unknown. However, if the surveyor's field notes were not supported by field work, his chicanery would sooner or later be exposed. As one surveyor noted, "In no other profession is a man's work so certain to show him for what he is as in surveying." Since flagrant abuses were certain to come to light in a relatively short period of time, most dishonest surveyors employed more subtile deceptions.

A contract surveyor was paid by the mile of line surveyed. They were also required to "meander" (run a line around) any major bodies of water they found and were paid the same rate for these meander lines. Some dishonest surveyors would increase their mileage by making a freehand drawing of a lake on his plat. Subsequent surveyors would find the expected lake-bed high and dry and supporting a growth of hardwood trees whose age left no doubt about the surveyor's honesty and imagination.

When tracing an old survey line, the modern surveyor hopes he will find evidence of the original marker at the end of his last chain. Often they do.

"You know, I would like to have known some of those old timers," one surveyor told me. "I would just like to walk up to shake their hand. You go into the field, follow their notes, and when you come to the

end of the line, there is the evidence of their marker right under your feet. Most of those men were as dependable as the stars."

"What kind of evidence do you look for?" I asked.

"Once a marker is set in place, there is almost always something to show for it—some evidence of its existence. Sometimes after a little digging, we find a piece of the old post below the surface. A bit of wood or iron, or even discolorations of the soil will show where wood has rotted or iron has rusted. We have the original field notes to tell us how the corner was marked and know what to look for. In the woods many sureyors would blaze and mark a "witness" or "bearing" tree as extra insurance to help future generations find his corner. Often we can find these trees and the field notes tell us that the corner was so many feet in a given direction from the tree. In open fields or on the prairie they dug pits to reinforce locations. Of course they knew that wood would rot and that iron would rust, so some of them would bury charcoal or a bottle under their posts."

"But suppose the surveyor was either dishonest or incompetent, what do you do then?"

"It can be utterly frustrating. When you get to the end of your line, you never know where you will find your corner."

"But why try? Why not set a new corner based on accurate measurements?"

"For a very good reason. Once a marker has been set and the survey has been accepted, it becomes official, and the courts always uphold property lines based on the original marker. They have to do that, otherwise disputes would never be settled. If you set a new corner, there would be no end to the repercussions that would be set in motion."

"Were most of the mistakes the result of faulty instruments?"

"A large number of them were. But when you followed a faulty instrument, there would be a consistent pattern to the errors. If the surveyor had a short chain, you will always find his corner a little short of your measurement and conversely if the chain was long. If the fault lay in his compass, you would find the corner a little to the right or left of your measurement."

During the time the frontier was being settled, the surveyor was often pressed to keep ahead of the line of settlement. According to the law, no land could be patented until it had been surveyed, but in reality, the surveyor often found settlements along his line of survey.

To keep up with settlement, the surveyor was told to concentrate his efforts on those lands suited for agriculture, mineral development or for the harvest of timber. Worthless land (all the rest) was not thought to be worth the cost of survey.

In accordance with his instructions and the views of the times, the surveyor often bypassed islands in lakes and streams, swamps, marshes, and many mountainous areas.

As times have changed, so have our values. Many of those lands not included in the original surveys are now considered exceptionally valuable. Swamps and marshes provide habitat for wildlife and provide opportunity to study unique plant and animal communities. Mountains and islands are in demand for homesites and for their recreational values. One example of land not included in the early surveys is the islands in the lakes and streams of Michigan, Minnesota and Wisconsin. Once considered not worth the cost of survey, they are now prized for the wealth of recreational opportunity they offer. Today the Bureau maintains an office in Duluth, Minnesota to survey and record data about these islands. (See "Islands of Many Waters of Many Dreams," OUR PUBLIC LANDS, Summer 1975.)

The original survey of public lands is now almost 80 percent complete. Yet new problems constantly arise to challenge the surveyor's skill. From all appearances, the surveyor's work will never be done.

A stream cuts through colorful red rock walls in the Paria Canyon Primitive Area located near the Utah-Arizona line. This area is also scheduled for early consideration for wilderness status.

Looking into the Kiger Gorge within the Steen Mountains of southeast Oregon. This area is rich in history as well as scenic grandeur.

PUBLIC LANDS

A NEW DIMENSION FOR WILDERNESS

New Federal Land Act Mandates Wilderness Survey of Public Lands

A distant view of Utah's standstone bluffs — a state that abounds in spectacular rock formations carved by water and wind.

The desert has a beauty all its own. This scenic area is located in Arizona's southwest desert.

Wilderness—how the concept intrigues us—to walk alone unbounded by space and unhindered by time, to view vast vistas and relax in the serenity of isolation. Like the wanderer returns home to recapture a precious memory of childhood, so a man enters the wilderness hoping to peer through the mists of time and reacquaint himself with his ancestral origins. In stripping away the trappings of our man-made environment, we seek a test of our ability to survive without them.

Wildernesses are demanding, but they are also fragile. In any contest with man and his machines, the wilderness always loses. Today they can survive only if man makes a conscious choice to preserve them. Once the people of the United States set the machinery of government to the task of conquering the wilderness—today it is necessary that that same government effort be directed to the task of preserving the few remaining areas that have wilderness potential.

Congress took the first step to preserve wilderness areas when it passed the Wilderness Act of 1964. Under this Act three Federal Agencies, the Forest Service in the Department of Agriculture and the National Park Service and the U.S. Fish and Wildlife Service in the Department of the Interior, were authorized to designate wilderness areas from among the lands they administered. Altogether the lands administered by the three agencies amounted to 242.8 million acres. Out of this total, they

have now set aside a total of 14.8 million acres for the preservation of wilderness values.

Whether by intent or oversight, more than 470 million acres of public lands, administered by the Bureau of Land Management, were not included under the Act.

This significant omission was corrected in the Federal Land Policy and Management Act of October 21, 1976. In that Act the Secretary of the Interior was directed to complete a study of BLM lands for the purpose of assessing their wilderness potential over a period of the next 15 years or October 21, 1991.

The wilderness study of public lands was emphasized by President Carter in his environmental message delivered to Congress on May 23.

By extending the authority to designate wilderness to public lands, Congress has provided the potential to increase designated wilderness areas over three times their present acreage.

Congress has also mandated that the public take part in reaching the decisions as to what BLM land will be designated as wilderness, and the Bureau has already asked the public to participate during the initial stages of its study. Further public involvement will be invited in subsequent stages of the study.

The Federal Land Policy and Management Act directs the Secretary of the Interior to study the wilderness potential of roadless areas of BLM lands having 5,000 acres or more and of all roadless islands. However, while we are waiting for those areas to be identified that have wilderness potential, all public lands will be placed under interim management so that none of their wilderness values will be degraded until Congress has had an opportunity to reach a final decision on a wilderness proposal. Existing valid rights would be honored even on those lands finally designated as wilderness areas.

Except for Russia, the public lands administered by BLM make up an area that is considerably larger than any nation in Europe. In surveying such an area for wilderness values, what do you look for? Beyond the specifications of the Federal Land Policy and Management Act, the Wilderness Act of 1964 sets out the criteria for wilderness in the following interrelated statements:

1. an area where the earth and its community of life are untrammeled by man,
2. an area of undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation,
3. an area that generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable,
4. an area that has outstanding opportunities for solitude or a primitive and unconfined type of recreation,
5. an area that has at least five thousand acres of land, or is of sufficient size to make practicable its preservation and use in an unimpaired condition,
6. an area that also contains ecological, geological, or other features of scientific, educational, scenic, or historical value.

Using the criteria and public input developed from public meetings and written comments, BLM personnel have prepared a survey system that will apply, consistently and objectively, to the lands under Bureau jurisdiction. The objective is to apply a method of evaluation that fairly considers each area and defines its basic wilderness resources, yet retains enough flexibility to include areas showing acceptable levels of human encroachment as opposed to a system that would look only at those areas wholly pristine in character.

Since even the design of the survey will have a significant impact on the amount and kinds of land that will eventually be recommended for wilderness classification, the survey process was developed only after the Bureau had held a series of public meetings and had carefully reviewed all public comments to its draft survey proposal. Interested parties thus have had ample opportunity to provide their input during the earliest stages of the classification process.

What do the BLM lands have to offer a national wilderness system? BLM lands have been sharply defined by history. The early pioneers didn't settle them

The Aravaipa Canyon Primitive Area in Arizona was mentioned in President Carter's environmental message and will be considered for early inclusion in the Wilderness System.

A typical landscape in central Alaska. Alaska ranks high among the states in land having outstanding wilderness qualifications.

The western front of the Rocky Mountains has many areas of public lands that have outstanding scenic attractions.

The Birds of Prey Natural Area along the Snake River in Idaho has been designated as a Natural Area because of the high concentration of eagles, falcons and other predatory birds.

because more attractive lands were available. At the turn of the century and later they were picked over and those areas considered best suited for national parks, national forest, and national wildlife refuges were segregated from them. What remains has been defined as the lands that nobody wanted. Yet in the beginning the public domain was so vast and so varied that is has defied the efforts of men to strip it of all its values and today much land with broad horizons and room to roam still remains for wilderness consideration.

Men have also changed their sense of values. Once men hurried across the desert to put such inhospitable and austere land behind them. Today we better understand the fascination of the desert ecology, and millions of city dwellers visit the remaining desert areas of the public domain. Once men looked upon juniper trees as a pest to be chained into submission, today their contorted twisted shapes evoke awe and admiration. Even the barren sage-brush prairie has found its admirers. The thrust of the wilderness preservation program is not necessarily to preserve those areas having scenic grandeur, but rather to identify lands that have retained a large measure of their natural integrity—lands that offer the opportunity for solitude and introspection.

BLM lands stretch from the border of Mexico to the Arctic Ocean. They include desert and tundra, sagebrush and rainforests, mountain meadows and dry lakebeds whose aquatic life lies dormant, waiting for rain. There are ghost towns and archaeological ruins, the ruts of the Oregon trail can still be seen crossing some BLM lands. In the southwest there are

Humbug Spires in Montana is another Primitive Area that will be included in early wilderness survey efforts.

ancient intaglios that can be properly seen only from the air, and in confined mountain defiles are flowers that can only be appreciated when viewed under magnification. Some areas have craggy stone needles that point like accusing fingers toward the heavens, and there are tops of mesas where no man has intruded.

Not all, or even most, of public land will be suited for wilderness classification. The task ahead is to sort out those areas that best typify the wilderness concept. This won't be easy. Almost every acre of BLM land will have its proponents who either want to make sure that it is included in a wilderness area, or that it is not. The job then is not only to identify those lands that best meet the wilderness criteria, but also to determine those upon which the public can come closest to a consensus regarding their future status. Controversy is certain, but with public help, the job can be done.

How will the job be done? The first step will be to meet the priorities set by Congress when it passed the Federal Land Policy and Management Act. Recognizing the efforts that BLM had already made toward preserving primitive values before the Act was passed, Congress has directed BLM to first consider those areas already set aside or identified as primitive or natural areas.

The Bureau is to report its recommendations on these areas to the President by July 1, 1980. There are 55 of them. Examples include: Arivipa Canyon, Arizona; Powderhorn Mountain, Colorado; Escalante Canyon, Utah; Scab Creek Area, Wyoming; Chenise Mountain, California; Centennial Mountains, Montana.

In addition to 11 designated primitive areas the Bureau has identified 44 natural areas. Any or all of these areas could be recommended for inclusion in the wilderness system by 1980.

The next step will be to look at the wilderness potential of public lands including Alaska and in the eastern part of the United States.

Public lands in Alaska offer a tremendous wilderness potential. Today the Bureau administers not only the greatest area of public land in Alaska, but also the largest area of land having the least human disturbance. Not all of the present public lands in Alaska will remain in public ownership. Forty million acres of the public domain there are destined for native selection under the terms of the Alaska Native Claims Settlement Act. For this reason, much of Alaska land remains in questionable status, so the wilderness survey there will be postponed to give the natives time to identify and select lands under the Act.

In the east a part of the survey effort will be in the Great Lakes region. Here some 10,000 islands will be examined in the light of their wilderness potential. These are islands that have remained in public ownership because they were not included in the early surveys of this region. Most of these islands are found in the lakes and rivers of Minnesota. While the study is going on in the Great Lakes area, the Bureau will also look at scattered publicly owned islands in other States including Florida, Illinois, Louisiana, Michigan, Mississippi, Missouri, Ohio and Wisconsin.

If all goes according to schedule, those lands meeting the criteria set out in the Federal Land Policy and Management Act and in the Wilderness Act will be studied. Reports to the President will list areas having wilderness values, and make recommendations concerning their suitability for inclusion in the Nation's wilderness system. Public views will be fully considered.

Congress has intended the expansion of the wilderness system to be a people program, public involvement is an essential ingredient. The public is you—get involved.

Water for Western Wildlife - Antelope

Water Proved to be Critical for the Antelope of Utah's West Desert.

At first glance, it is hard for anyone who has worked with western wildlife to understand why Utah has so few antelope.

Several years ago biologist Charles Sundstrom compiled figures on antelope (or pronghorn) populations and found that Utah had only about 1,200 animals. By contrast, Wyoming, Utah's neighbor to the northeast, had the Nation's largest antelope population—some 200,000 animals. Other states contiguous to Utah had populations ranging from 4,500 in Nevada to 20,000 in Colorado. The Utah Division of Wildlife Resources estimates that, as a result of natural increases and releases in new areas, the population in the state now exceeds 2,000—a significant increase, but still below numbers in surrounding states.

Before moving to Utah in 1974, I had worked with pronghorns intermittently for many years and wondered why the population here was so low. There were million of acres of open land that, at least superficially, looked like good antelope range. Apparently there was some limiting factor in the environment that was not immediately evident.

Antelope, like all animals, are fitted by nature to fill a specific niche in the environment. Wild animals are totally dependent on their habitat for all the necessities of life and for their continued existence. The habitat provides all the animal's food, water, and a relatively safe place to bear and raise its young so that deaths will not exceed additions to the population.

The capacity of the habitat to support a given species is always limited, but the species has the capacity to produce more animals than the environment can support.

In many cases is a single element in the environment that becomes the limiting factor on animal populations. If that limiting factor is relieved, the numbers of the species may increase until brought in check by another limiting factor. A major function of wildlife conservation, then, is to identify and eliminate these bottlenecks.

Was the quality or quantity of forage the limiting factor? Antelope feed primarily on browse (the foliage of brushy plants) and forbs (herbs other than grasses). Grass itself is usually of minor importance in their diet. I found that in the northwestern part of the State, a region called the West Desert, most of the vegetation consisted mainly of saltbrush types merging into sagebrush and pinyon-juniper on the lower slopes of the mountains. Forb production, as in other extremely dry parts of the west, varied greatly from year to year depending on the precipitation. Forage quality was not ideal, but it compared favorably with the vegetation in other areas where antelope have fared well. For example, on the Mescalero Apache Reservation in southern New Mexico, the pronghorn population had grown from 200 animals in 1968 to 700 in 1973 on 25,000 acres of primarily short grass range. The habitat there contained none of the larger species of sagebrush (sometimes thought of as being synonymous with antelope country) and only small quantities of herbaceous sage. Bitterbrush was also completely absent there although there were small quantities of Apache plume, a brouse plant that faintly resembles it. Another unfavorable feature of the Mescalero range was that most of its rain fell between July 4 and mid-September which meant that the fawns usually were born thirty to

forty-five days before the end of the nine-month drought.

The West Desert is dry, usually getting only 6-10 inches of moisture in an average year. However, the precipitation that does fall usually comes during the winter and spring. This accounts for the presence of sagebrush and also means that the rain and snow has a chance to exert some beneficial effect on the vegetation shortly before fawning season.

From these observations, we decided that while the West Desert's vegetation was far from ideal for antelope, it did compare favorably with other areas having a greater density of population.

But what about temperature? Was the West Desert either too hot or too cold for antelope to endure. It was not nearly as cold as the windswept high plains of Wyoming or Montana. It was no hotter than southeastern New Mexico and not as dry as the Big Bend country of Texas—all places that supported larger numbers of pronghorns.

Was the critical factor water? For many years, game managers had doubted that antelope actually required drinking water. In his early book "Game Management," Aldo Leopold says, "I conclude that antelope are like mule deer; they drink regularly when they can, especially does at fawning time, but they subsist and reproduce on succulence alone where circumstances require."

My personal experience seemed to bear this out. In the summer of 1947 I studied antelope in the Texas panhandle and hadn't seen them drink even though I had observed them in the vicinity of wells. However, as I now recall, that had been a relatively wet summer with an unusual good supply of succulent forbs throughout the range.

Furthermore, I believed that since there was enough water on the Utah range for domestic livestock, there should certainly be enough to support the antelope population.

But further study of the literature raised doubts. In 1975 Donald M. Beale and Ralph C. Holmgren, biologists with the Utah Division of Wildlife Resource had conducted experiments on the Forest Service's Desert Experimental Range near Milford, Utah. In this experiment, antelope were confined to different experimental pastures—some with and some without water. After 17 days those animals in pastures without water appeared to be dehydrated and very weak. All personnel connected with the experiment were satisfied that these animals would not survive much longer so their troughs were filled with water. These animals recovered after having water available for several days.

Water was again withheld from two pastures. At this time there was a good stand of Russian thistle in one pasture, but even with the succulent food, the animals could not get enough moisture, and it was necessary to refill the water troughs after a period of several weeks.

The assumption that there would be enough water for antelope on a range having enough water for livestock proved to be another illustration of the danger of not questioning the "obvious" and in trusting simple answers when dealing with nature.

While developing plans for its Salt Lake District, the Bureau and the Utah Division of Wildlife Resources had decided to stock antelope in Puddle Valley. This area consists of some 250,000 acres of West Desert lying about sixty miles west of Salt Lake City. Most of the area is administered by BLM. Utah's Wildlife Department released seventy pronghorns there in December of 1975, and, in anticipation of funding through the Sikes Act, I was assigned to work with state biolo-

gists to develop a plan for the management of the habitat. In the process we discovered some surprising facts about the area's water supply.

Large tracts of this land were without any permanent source of water such as springs, streams or lakes. The evaporation rate is high—from 55 to 60 inches a year. Impoundments to provide water for livestock have been developed over the past 100 years, but these are shallow reservoirs with large surface areas and are susceptible to rapid evaporation. During a typical dry summer and more particularly in years that are abnormally dry, these reservoirs dry up. Livestock grazing in the area is usually confined to winter months, and they depend primarily on water pumped from wells by the livestock operators during this time. As a result there are hundreds of thousands of acres of desert land without a drop of water during the summer when the antelope need it most.

The joint BLM-Utah Division of Wildlife Resources plan for Puddle Valley seeks to develop water for wildlife that will be available during summer months at 27 locations. In 12 areas water would be pumped from wells and stored in large tanks. It would be made available to the antelope in small watering troughs. Eight of the shallow reservoirs would be converted to deep pit-type reservoirs called "charcos." These provide a large storage capacity with a relatively small surface area and greatly reduced evaporation rate. We would also like to build seven guzzlers. A guzzler is a paved watershed that collects water for storage in a tank. The water is made available for animals in troughs fitted with float valves.

The primary reason for building these watering facilities is to benefit antelope, but available water will also benefit other forms of wildlife.

Rudy Drobnick is a veteran biologist for the Utah Division of Wildlife Resources whose hobby is making movies of wildlife at remote desert waterholes. He sets up a camera that is activated by a photo-electronic sensor that reacts to movement. He aims the camera at the area just above the water and leaves it for several weeks. When he comes back, he has a photographic record of the birds and mammals that came to drink. A clock and other automatic devices record the hour and date of each visit.

Rudy now has a collection of film showing eagles, antelope, deer, coyotes, ground squirrels, chukar partridges, pinyon jays and many other creatures that use desert water holes.

He says that we have taken water for granted as it affects wildlife. "We are just beginning to gain an understanding of how important water is, particularly in these desert areas. Much of this country has all the habitat requirements for many species except one—water. Provide dependable water year around and I think we'll see animals using many areas that they have not been able to use during the dry summer months, and we'll insure survival of populations during droughts."

Game biologists are not the only people interested in the Puddle Valley project. Jay Bertagnole, Ken Byram, Darrell Byram and Hatch Howard are local livestock operators who graze their livestock in the area. They have voluntarily pumped storage tanks at five wells full before they left the range at the end of the 1976 spring grazing season, so that the antelope would have water for part of the summer.

Rex Willden, a sportsman who lives in Salt Lake City, has also encouraged the development of water for wildlife on the West Desert. Recently he donated $200 to the Utah Division of Wildlife Resources to help a local rancher install a new pump on one Puddle Valley well. The rancher will use the pump to supply water for his cattle during the grazing season, but will continue to operate the well during the summer to provide water for wildlife.

Offroad vehicle users have also cooperated. At the time the antelope were released, it was decided that offroad vehicle use should be restricted in the area until the antelope became established. This proposal was discussed in several public meetings with offroad vehicle users and others. Most of the users agreed to go along with the restrictions. Division of Wildlife Resource officers responsible for the area say that violations have been minimal.

Even a missles manufacturer, the Hercules Corporation of Magna, Utah, has offered help by donating surplus rocket bodies to be used as water storage tanks and equipping them with the necessary plumbing. These storage tanks have about a 3,000 gallon capacity.

Continued public interest combined with appropriate support from the responsible state and Federal agencies is providing a brighter future for all wildlife on Utah's West Desert.

Small basin provides water for quail and small mammals

Water for Western Wildlife -

The Desert Bighorn

A Volunteer Group Takes Action to Improve Arizona Range for Desert Bighorn

The Arizona night was brittle as the wintry northwind laced the hillside. A group of shivering but dedicated people, who had driven into the night to keep this back-country rendezvous, waited impatiently to make camp. Their caravan of pickup trucks and 4-wheel drives had been drawn close to protect them from the elements in much the same fashion of pioneers drawing their wagons into a circle to protect against a charge of hostile Indians. At the appointed hour of 10:30 light beams were seen bouncing across what looked like a luna landscape. The late-starters were pulling in after a 240 mile trek from Phoenix.

During the next two days and nights more than a score of volunteers worked with biologists from the Bureau of Land Management and the Arizona Game and Fish Department to develop an isolated natural basin into a permanent water tank for Desert Bighorn Sheep.

Most of the work was done by the volunteers—members of the Arizona Desert Bighorn Sheep Society. This organization is dedicated to the restoration, management, conservation and propagation of the desert bighorn. The Society is the backbone of such construction efforts. Its active members participate in several habitat-improvements each year. They work under the guidance and direction of professional wildlife managers from the Arizona Game and Fish Department and the BLM. BLM is evolved because 80 percent of the desert bighorn's habitat in Arizona is on BLM land. In the last year alone wildlife biologists from the Phoenix and Yuma District Offices have taken part in six habitat-improvement projects. The Arizona Game and Fish Department is, of course, glad to encourage any development of wildlife habitat.

Working together, these three groups hope to encourage the comeback of one of America's magnificent game animals. Although there are an estimated 2500 sheep left in Arizona, much of their former range has been reduced in recent years by encroaching civilization. Man and his machines have left few corners of the wilderness untouched and isolated. Sheep are sensitive and easily disturbed. The encroachments of men have caused them to retreat to some of the most rugged and out-lying areas of Arizona's desert mountains. But even here, the lack of water may be a limiting factor that prevents them from using large areas of otherwise suitable habitat.

While developing plans for improving wildlife habitat, BLM had identified water development as one way of improving conditions for Desert Bighorn. After that, BLM and State wildlife biologists started to look for suitable sites while they were in the field.

Once a promising area is found, the biologist make an informal evaluation of its potential. This is followed by a more formal environmental assessment of the expected impact development would have on the surrounding area. If everything looks favorable after this, BLM and the Arizona Game and Fish Department work out a cooperative agreement spelling out the details of the construction and maintenance of the project. Once all details are agreed upon, a construction date can be scheduled with the Bighorn Sheep Society.

Water development in the bighorn ranges include tank cleaning, dam construction, silt retention and diversion structures and the sealing off of fractured natural waterholes.

A rock hole filled during the wet season may hold water for several months, but since most such holes are shallow, most of the water that might be caught ends up as runoff, or else gradually seeps through the porous surfaces of the rock. Although studies on the relationship between bighorn and water remain inconclusive, it seems likely that the temporary nature of such waterholes keeps the animals from using much of their potential range for much of the year.

The late-night rendezvous in north-west Arizona, described at the beginning, had to do with a rock basin in the Black Mountains called the Van Deeman Tank. A routine ground survey had found the sight and BLM biologists had recognized its potential. Here a steep-walled wash worked its way down the side of a mountain creating a series of shallow basins. At the point where the large basin dropped away to the one below, a twelve-foot gap between shale walls formed a natural site for a small retention dam. BLM biologists believed that such a structure would provide a permanent supply of water, that this would enable the bighorns to establish themselves permanently in what had heretofore been only a seasonal range.

A steel-reinforced masonry dam spanning the gap between the basin walls would provide the storage capacity to hold a permanent water supply. But building such a dam sounds simpler than the reality. All tools and materials had to be packed into the site. In this case it was only a few hundred feet. On other projects it had been more than a mile. Even so, ninety pound bags of cement, cut in half and placed in plastic for easier handling, became quite a load when carried sack by sack up a rocky hillside.

That was only the first step. In order to tie the dam into the rock face, holes one inch in diameter and six inches deep had to be drilled with a gasoline powered rock drill and breaker. Horizontal and vertical reinforcing bars were then imbedded in the rock to form a mesh frame. Boulders were brought from the nearby hillside and mortar was mixed in buckets. The boulders were set and cemented into place with the mortar until the dam stood 6 feet high. When finished it was a work of art, stretching nearly 12 feet across and tapering from 3 feet thick at the base to 18 inches at the top. It had been plastered and painted a natural camouflaging tone so that it stood unobtrusive and nearly invisible between the walls of rock outcrop. The basin itself had been sealed with a coat of cement plaster to further insure that it would hold water.

But the dam was only a part of the project. Above the pool on one side, where the wash broke over the rock-lip, a gabion structure had to be built. This was a rock-filled wire basket constructed to provide a structure to divert silt away from the reservior. Again holes were drilled into the rock. Six-foot steel fence posts were mortared into place two feet apart in a parallel line. Wire screen was stretched and tied onto the posts for the length of the mesh basket thus formed. Four tons of loose rock and boulders filled the basket.

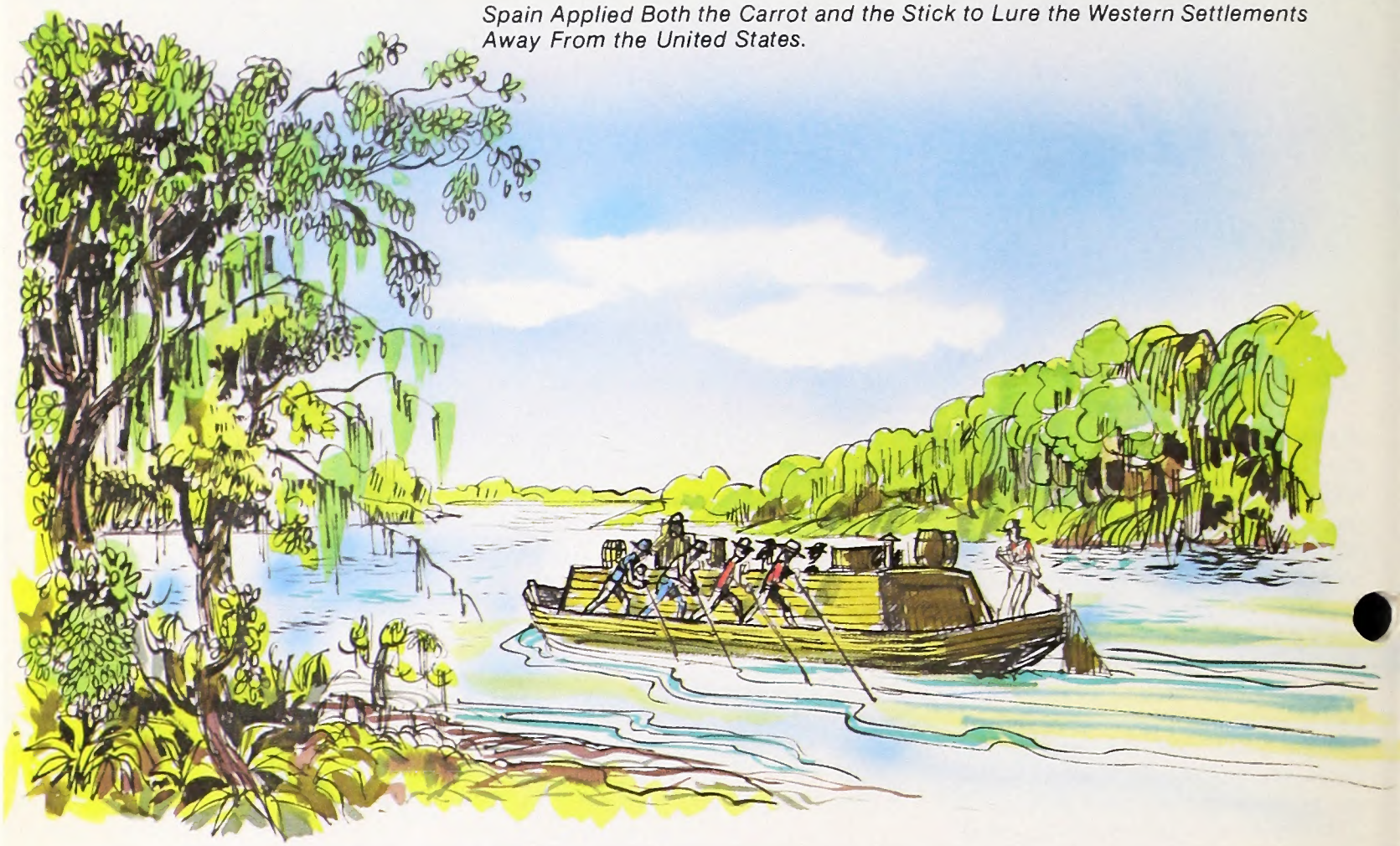
The weary volunteers finished on schedule late Sunday afternoon. Now they only had to drive the 200 miles back to home and more conventional labors.

The new reservoir, well-hidden from the human eye, will be a welcome improvement for local residents. Birds and small animals can easily get to the water. Difficultly access for larger animals will keep burros and cattle from using the water, but the incredibly sure-footed bighorns will have no problem skipping down the rock-face to slake their thirst.

The dam which adds a new source of water and opens up new range, was built for less than $300 worth of materials, but required more than 500 man-hours of intensive labor, inestimable numbers of blisters and sore muscles. It was this labor that would have made the dam expensive had it been built by conventional methods. Such projects would be slow in coming were it not for the volunteer work of the Arizona Desert Bighorn Sheep Society members and the cooperative efforts of the Bureau of Land Management and the Arizona Game and Fish Department. In the interest of everyone, there will be many more desert rendezvous.

An Approach to Secession

Spain Applied Both the Carrot and the Stick to Lure the Western Settlements Away From the United States.



The American victory of Fallen Timbers did not end all Indian attacks against the western settlements, but it effectively broke the back of Indian resistance to westward expansion. It also averted, for a time, thoughts of secession among those who lived on the frontier. In that respect, victory came none too soon.

At the end of the Revolution, England had ceded Florida and a strip of land along the Gulf of Mexico to Spain. That gave Spain control of the Gulf coast and a virtual strangle hold over the economic well-being of the settler. Mountains, a vast expanse of forest, and poor or nonexistent roads made it impossible for the settler to haul his crops to an eastern market. Conversely, the Mississippi River and its tributaries offered an easy outlet to the Gulf of Mexico, but control of the port of New Orleans gave Spain the power to grant or deny the settler's use of this outlet. Through the years, Spain used that power capriciously. The poor settler was at her mercy.

From the moment he crossed the mountains, the settler lived under the specter of violent death. That threat he recognized and accepted. What he could not accept was the economic strangulation imposed by Spain and what he saw as his government's indifference to his plight. Under the circumstances, many westerners toyed with the idea of taking the western territories out of the union with the eastern states and joining themselves to Spain.

Spain continued to entertain hopes of establishing an empire east of the Mississippi River. Her control of Florida and the Louisiana was not disputed, but those lands east of the Mississippi River and north of the 31st parallel had always been considered an extension of first the colony and then the state of

Georgia. Suddenly, Spain asserted a new claim. According to this claim, the Spanish boundary ran north along the Flint River and continued north from the headwaters of the Flint to the Tennessee River. It then followed the Tennessee River to the Ohio and the Ohio to the Mississippi and juncture with recognized Spanish holdings west of the Mississippi. Included were lands in what is now the western part of Georgia, all of Alabama and Mississippi, the western parts of Tennessee and a portion of Kentucky.

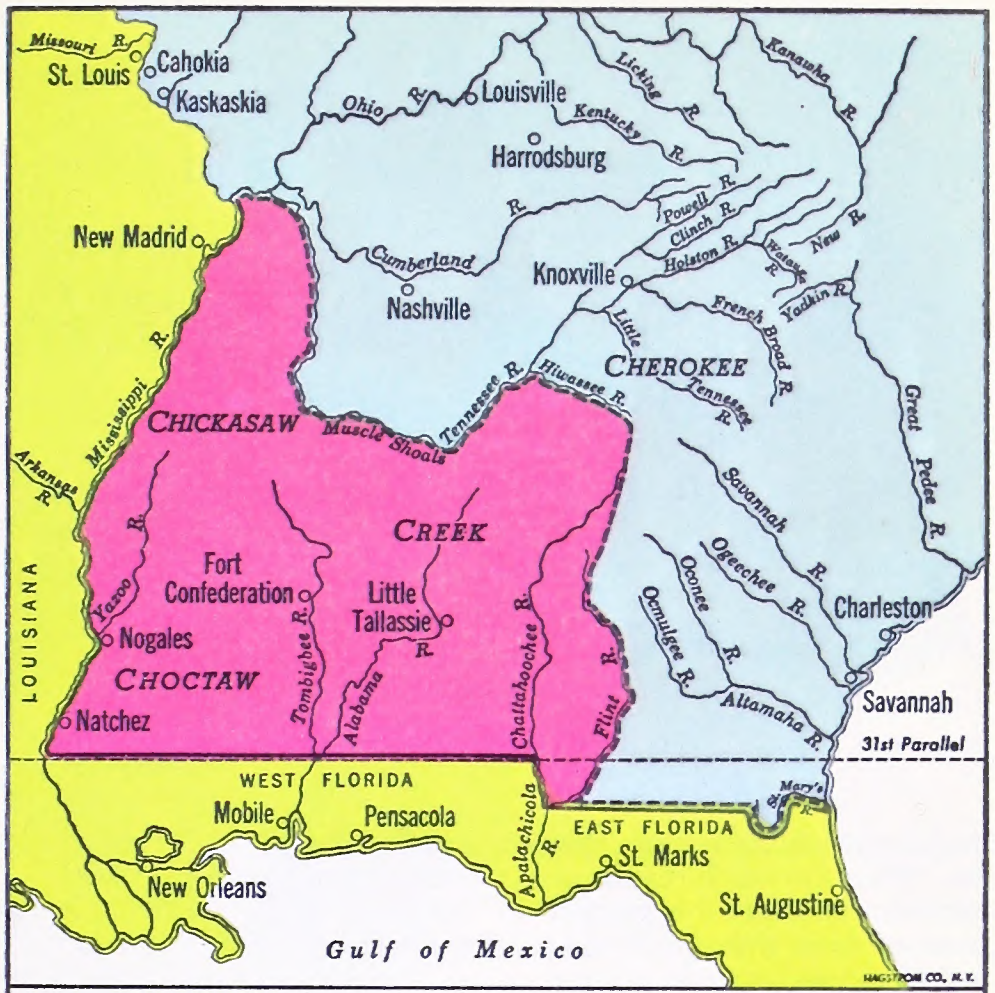
It was strictly a paper claim supported only by a line on a map. Spain had no settlers to occupy the land, and correctly understood that her claim would soon be invalidated by the settlers that were then crossing the mountains.

The Governor of Spanish New Orleans at the time, and the man who was responsible for maintaining Spanish control of the Southwest, was Estiban Miro. In pushing Spanish interest, Miro settled on the principle of the stick and the carrot. On the one hand he would encourage the Indians to scourge the settlers. At the same time he would woo the settlers to renounce their ties with the United States and invite them to seek refuge in Spain's protection.

In 1784 he closed the lower Mississippi River to navigation by American boats.

This was the economic threat that the settler feared most. There were threats to mount an armed invasion to drive the Spanish from New Orleans, but in 1785, the United States Senate voted 7 to 2 to ratify a treaty that would recognize Spanish control of the lower Mississippi for a period of thirty years. The vote was not decisive; it required nine votes to ratify a treaty, but to the westerner it appeared to be a clear indication of the lack of congressional interest in the West.

With no one to turn to, the westerners were forced to rely on their own resources. Many questioned the advantage of being a part of a Nation that had no interest in their welfare. It was a time of discontent, and into the picture came a man who was superbly endowed to make the most of the situation. His name was James Wilkerson. As a merchant in double dealing, Wilkerson was to make Benedict Arnold look like a piker.



He had not been exposed. One of his special skills was a sixth sense that told him the opportune moment to switch sides or when it was to his advantage to betray former friends and fellow conspirators. In 1783 he arrived in Kentucky.

He was a small man and was now in a country where men made their way by brawn. But he had a glib tongue and an engaging personality that made both men and women like him. To his credit, he seems to have been a devoted family man. Within a short period he was the political leader of the Territory. In less time than that, he was aware of the currents of discontentment that swirled through the frontier communities.

In 1787 he loaded a cargo of corn and tobacco onto a flatboat, and in defiance of the Spanish ban, set out for New Orleans. As soon as he landed, he confronted Governor Miro in his office. He charmed the Governor as easily as he had charmed the crude frontiersmen. Before he left the city, he had not only sold his cargo at a handsome profit, but had sworn allegiance to the King of Spain. He was duly entered on the Spanish intelligence rolls as Agent 13. In return for his salary from the Spanish Government, he had promised to use his influence to persuade the western settlers to secede from the United States and make their alliance with Spain.

When Wilkerson returned to Kentucky, he was much admired for his success to selling his crop to the Spanish. The price of corn and tobacco immediately went up, and if anyone suspected that he had sold more than his crop, no one

cared to make an accusation. Thereafter, Wilkerson made regular and optimistic reports to the Spanish Governor—and always with the suggestion that he could accomplish more if only he had more money.

For a career in intrigue, he had made a fair beginning, but in the years ahead he would also be on the payroll of England and France as well as Spain. To all three he sold the same service, his influence to win the West away from the United States and into the fold of whichever paymaster he happened to be in contact with at the time.

Any censure that he deserved, is somewhat diluted by the fact that almost every prominent westerner was speculating about the advantages of an alliance with either Spain, England or France at this time. In Tennessee, both John Sevier and James Robertson were openly flirting with Governor Miro, but with one difference, they were not on the Spanish payroll.

In 1788 Andrew Jackson moved to Nashville and took up residence in the home of Rachel Donaldson's widowed mother. He had come to practice law and brought with him his hounds, a single female slave and a vital piece of information. The new Federal Constitution had been adopted when New Hamphsire became the ninth state to vote for ratification on June 21.

Jackson was better received than his news. In Nashville, as elsewhere in the West, people looked on the new Constitution with deep suspicion and considered it a grave threat to individual freedom.

Jackson, who as President would save the Union from a much later threat of secession, had hardly unpacked his bags before he was involved in the Spanish conspiracy.

In fact nationalism was nowhere strong in the new republic. These were men of a generation that had renounced their age-old allegiance to their King, and the new Nation was much too untried to evoke intense devotion or command unquestioned loyalty. Even in the East a man placed loyalty to his State before loyalty to the Union. If questioned, a man would say that he was a Virginian or a Massachusetts man before he would declare himself a citizen of the United States.

One of the last acts of the Congress operating under the Articles of Confederation had been to refuse to admit Kentucky into the Union as the 15th State. In 1788 delegates from all parts of the State met in Danville to decide what they should do in light of this rebuff. James Wilkerson was chairman of the convention. Without doubt, secession was discussed in the hallways and in the taverns, but no resolution to that end was ever introduced on the floor.

It is now impossible to say how much Wilkerson actually worked to bring about such a resolution. He made regular reports to Miro, and strongly hinted that if he were entrusted with a large sum of money, he could buy the loyalties of many of the delegates. There is evidence that the Spanish forwarded a substantial sum to Wilkerson, but he delivered nothing.

It was in the context of this situation that Wayne's victory had its greatest meaning. After a series of humiliating defeats on many fronts, it gave westerners a reason to be proud of their countrymen. It showed them that their Government had not abandoned them to the mercy of their enemies. The victory did not put an end to secessionist sentiments, but it did turn faces toward the East.

There were other events that worked against the secessionists. Congress granted statehood to Kentucky and a bit later to Tennessee. Spain allied herself with the westerner's arch foe, Great Britain, and slowly the movement died on the vine.

To the north Wayne called the defeated tribes together and made a new treaty to be known as the Treaty of Greenville. For the third time he paid the Indians for the land they had agreed to vacate before the hoard of settlers crossing the Ohio. Out of the Treaty of Greenville came a new line and new promises to the Indians that time and circumstances would make void.

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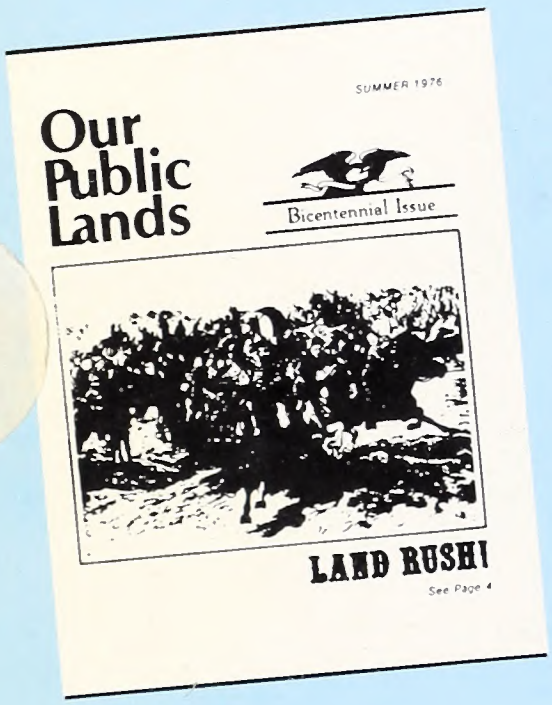

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